- disconnect detection
- mandated blocking for 900-type services

24. An unbundled port provides the ability to originate and terminate local and toll calls, and also provides access to local usage services and vertical services which can be resold. It provides access to 911 and E911 calling, and to LEC operator services (including directory assistance), but does not include charges for operator services. Similarly, an unbundled port can be used to obtain access to, but does not include, vertical services available in or through the LEC's switch.

25. Applicable technical specifications are included in *American National Standard for Telecommunications - Interface Between Carriers and Other Telephone Company Installations, Analog Voice Grade Switched Access Lines Using Loop-Start and Ground-Start*, ANSI T1.401-1993, and *Bell Atlantic TR-72575*, as supplemented by industry and local practices.

26. From a technical perspective, I believe that this unbundled port definition largely meets AT&T's definition of its "switching basic network function" providing dial tone, basic switching, signaling, digit reception, dialed number translations, routing and rating, call supervision, announcements, calling features and capabilities, centrex and CIC code determination. The sole exception is AT&T's inclusion in its switching function definition of access to end office Advanced Intelligent Network triggers. As I discuss later, there are significant technical issues associated with providing this access, and the Commission is currently scrutinizing the issue.

27. The switch port, as defined above, is unbundled to the greatest extent technically feasible. Co-carriers that lack a switch can combine the switch port with existing switched services they desire to offer local service. In contrast, the theoretical "local switching platforms" and proposals for switch capacity that have been suggested are ill-defined, but appear to be attempts to rebundle certain switching capabilities and make them available on a per line or per carrier basis. Switching system generic software and common hardware is not engineered and cannot be partitioned on a per line or per carrier basis, however. Instead, switch capacity is engineered on a variety of factors, including both individual components such as line and trunk circuits, service circuits and memory, and the different relationships among these components. For example, although an individual line circuit is dedicated to a particular customer, the components that comprise that line circuit are typically mounted on a circuit pack that supports several lines, which share common microprocessors and other components. More important, a switching system has many shared components such as central processors and a large amount of common software that are shared as needed to perform various call processing and operations tasks for all the subscriber lines connected to that switch. There is no way to assign parts of the common software or other components of the switch to individual lines, and no way to partition the switch to prevent one co-carrier whose use of the switch exceeds the "capacity" it purchased from interfering with the capacity available for another carrier, potentially degrading the service quality to the second carrier's customers.

Collocation

28. Collocation in structures housing LEC network facilities on public rights of way, such as vaults containing loop concentrators is not feasible. There has been no change since the Commission found in 1992 that collocation in such vaults is technically infeasible because of their small size and network security problems. Then, as now, the controlled environmental vaults (CEVs) that Bell Atlantic (and other LECs) installs are unmanned, with a single entrance, ordered and installed to house limited numbers of equipment bays.

29. The CEVs that Bell Atlantic employs are six feet wide, nine feet high, and either sixteen or twenty-four feet long. The bulk of the CEV structure is placed underground, with access available only through a single key-locked door at the top and down a ladder. There is one room in each CEV, with all equipment easily accessible to the technician entering the vault. The equipment space within each Bell Atlantic CEV is fully occupied with Bell Atlantic's equipment. None of the CEVs contains sufficient space to construct a collocation cage, nor is it possible to prevent a collocator's employee who enters the CEV from gaining access to equipment of other collocators or of Bell Atlantic. Given the design of CEVs, they are not capable of supporting physical collocation arrangements. In the future, Bell Atlantic plans not to deploy additional CEVs but to place small equipment cabinets above-ground. These cabinets have locked doors that open to expose the equipment. All equipment inside the cabinet is accessible

to the technician from outside the structure. Therefore, these cabinets will have far less room than CEVs and they, too, could not accommodate physical collocation.

Databases and Signaling Systems

SS7 Interconnection

30. The SS7 network was designed to allow interconnection by all parties -- Bell Atlantic and competitors -- only through the Signal Transfer Point (STP) and access at other network locations is not technically feasible. Interconnection at the STP provides Bell Atlantic and its competitors with all of the SS7 functions. Moreover, the STP has been designed to provide certain necessary routing and translation functions that are not available elsewhere in the SS7 architecture. These functions include:

- Load management, to facilitate and control the flow of traffic through the SS7 network.
- Message routing and destination verification.
- Message format verification.
- Screening and security, to prevent unauthorized messages from entering the network. The Commission stressed the importance of this feature in ***Ameritech Operating Companies***, DA 96-446 at ¶ 3 (rel. Mar. 27, 1996).
- Global title translation, that facilitates routing of the messages.

31. The SS7 marketplace is competitive and several vendors provide SS7 transport services. Independent LECs, interexchange carriers and co-carriers that choose not to invest in SS7 transport equipment may obtain SS7 transport from any of these separate vendors, including Independent Telephone Network, Transaction Network

Services and MCI. Independent SS7 providers offer an out-of-band signaling channel which allows the service providers to interconnect with other SS7 networks. These service providers must still upgrade their switches and other equipment in their central offices to accept and process the SS7 out-of-band signals.

32. Through use of these vendors, service providers are able to offer their customers a variety of interconnected services that would be unavailable without SS7 capabilities. These include such popular features as Calling Number Identification (Caller ID) and Calling Name Identification, as well as enhanced call set-up functions and such Custom Calling features as Repeat Call and Return Call.

33. The SS7 software in Bell Atlantic's switches that provides call processing functions is tightly integrated to work only with the associated transmission path (i.e., the local dialtone line). This is because the software was designed by the switch vendors so that the complex call processing functions needed to provide a customer with such functions as Caller ID, Calling Name Identification, Call Waiting, and other switch-based optional features on a customer's line are inseparable from the functions needed to provide basic telephone service over that line. As a result, it is technically infeasible for Bell Atlantic to provide another service provider with the switch capabilities to offer any of these SS7-based optional services without also providing the basic functions of the switch port described above. Even if the functions could technically be separated, which they cannot, the software is provided to Bell Atlantic as an integrated whole, and Bell

Atlantic is not at liberty, under its software license from the vendors, to sub-license all or any parts of the software to third parties.

AIN

34. Access at the Service Management System (SMS) level of Bell Atlantic's Advanced Intelligent Network (AIN) would allow a third party to create any services that utilize the AIN system. For example, a co-carrier could subscribe to SMS access and develop a service for its customers that would instruct Bell Atlantic's switch to route a call over an interconnected co-carrier's network to a telephone served by that co-carrier based on pre-established criteria (e.g., time of day, day of the week, "sign-on" registration signal received from the destination telephone set, etc.). At other times, the call could be routed to a wireless network, to Bell Atlantic's network, or directly to an interexchange carrier (IXC) over the facilities of the access provider designated by that IXC. Therefore, telecommunications service providers may obtain access to all AIN capabilities through SMS access.

35. Mediated access at Bell Atlantic's Service Control Point (SCP) is not technically feasible today. Bell Atlantic's AIN platform was developed by Bellcore for Bell Atlantic. Software that would allow Bell Atlantic to provide mediated access would require substantial additional development work. This software is very complex, and I cannot predict a date when it could be deployed. Moreover, to my knowledge, no AIN technology deployed in the United States is capable of providing mediated SCP access. The various networks deployed in this country use a variety of intelligent network

platforms and a number of manufacturers' switches. Even though Bellcore has released a set of recommended intelligent network standards, not all vendors of platforms or central office switches have implemented those standards. Therefore, it is likely that the various intelligent networks are not fully compatible. Several LECs have proposed a nationwide intelligent network trial and study that will allow the industry to work as a whole to develop and implement uniform nationwide interconnection standards that will facilitate future intelligent network deployment.

Bona Fide Request Process And Expert Negotiations

36. A bona fide request procedure to facilitate the orderly unbundling of any additional network elements that may, from time to time, be proposed by co-carriers will benefit both co-carriers and incumbent LECs such as Bell Atlantic by allowing them to ascertain which network elements are desired, assess the impact that unbundling those network elements will have on network operations and other customers' services, determine whether trials are necessary, and help them prioritize their internal re-engineering processes. A process such as the one the United States Telephone Association has proposed will enable Bell Atlantic to address on a priority basis additional unbundling co-carriers desire to provide actual services to their customers.

37. A critical step in this process for additional unbundling or interconnection requested of Bell Atlantic is negotiations among the carriers' and Bell Atlantic's technical experts. As I have discussed, there are complex technical and operational issues that need to be worked out before unbundling of sub-loops or switching platforms is even possible.

Other unbundling requests we might receive will have their own technical and operational issues that need to be explored. The engineering and operations employees of Bell Atlantic and the co-carrier are in the best position jointly to find solutions acceptable to both parties before time, effort, and money is spent in search of a solution that ultimately the parties do not want, cannot use, are unwilling to pay for, or that technically will not work.

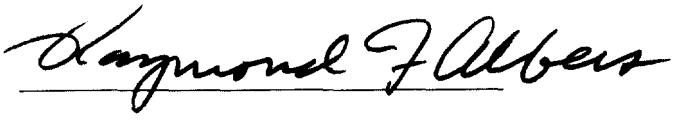
38. These negotiations and open dialogue are standard procedure among telecommunications companies today, when, for example, Bell Atlantic requires new network capabilities. Bell Atlantic approaches the equipment vendors, describes its needs, and works with the vendors to develop technical requirements. The vendors give an estimate of the cost and Bell Atlantic makes a commitment to purchase prior to further development of the new capability, so that both parties have an understanding of what is required, how much is required, and how costs will be recovered.

39. By contrast, neither party benefits when requirements are imposed unilaterally, without joint effort in development and commitments to purchase. For example, co-carriers requested that Bell Atlantic-Maryland offer Flexible Direct Inward Dialing (FLEX DID). Bell Atlantic spent approximately 2150 person-hours in testing and developing methods and procedures for the provisioning of FLEX DID, but co-carriers have decided they did not want the service after all. As a result, not a single order for that service was ever received, processed or billed from anyone. Similarly, as required by the Commission's ONA proceeding, Bell Atlantic identified and tariffed some 15

interstate Basic Service Elements, but there has been virtually no demand for more than 85% of them. Such wasted effort could have been avoided under a bona fide request process, where joint exploration of the requests and the subsequent dialogue among the subject matter experts might have clarified both parties' needs and identified more effective technologies.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and belief.

Executed on May 16, 1996



Raymond F. Albers

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of the Local Competition	)	
Provisions in the Telecommunications Act	)	CC Docket No. 96-98
of 1996	)	

Declaration of Ross M. Richardson

1. I am a Principal at Strategic Policy Research, Inc. My business address is 7500 Old Georgetown Road, Bethesda, Maryland, 20814-6122. I received a B.A. degree in mathematics and economics from Indiana University, a M.A. degree in mathematics from Pennsylvania State University. and a J.D. from Rutgers Law School. I have worked in the telecommunications industry since 1985, when I joined AT&T Bell Laboratories as a Member of Technical Staff in the Switching Systems Engineering Division. There I planned new services for the AT&T long distance network, including services based on Direct Services Dialing Capabilities, an Intelligent Network architecture proprietary to AT&T. I also helped to plan the initial deployment of SS7 network interconnection, as well as CLASS and ISDN capabilities. With others, I was awarded two United States patents for new services I conceived and helped develop.

2. In 1989, I joined Southwestern Bell Corporation (SBC) Technology Resources, where I became Principal Member of Technical Staff for Architecture in the Technology Planning and Strategies Division. While at SBC, I continued work on issues arising from the interconnection of advanced voice, data, video and mobile networks. I also helped to specify open telecommunications platforms for the delivery of broadband and narrowband services. I represented SBC in the Bellcore Multivendor Interaction Forum and I participated in the

specification and development of the Advanced Intelligent Network architecture and the Bellcore Information Networking Architecture.

Summary

3. In this Notice Of Proposed Rulemaking (NPRM) the Commission tentatively concludes that it is obligated to identify network elements that incumbent LECs (LECs) should unbundle. In particular the Commission suggests that the capabilities of the local switch be unbundled, and it asks what minimum requirements should govern such unbundling. I examine this issue, beginning with a discussion of unbundling switch capabilities in general and the advisability of performing such unbundling in the context of regulatory proceedings. I recommend that most unbundling should be the result of negotiations between LECs and those carriers actually requesting access to network elements. I conclude by analyzing an example of proposed unbundling undertaken in the absence of negotiations among carriers.

Unbundling Defines New Services And Their Markets

4. When analyzing approaches for the unbundling of local switch capability, it is important to bear in mind that the object to be "unbundled" is, for all intents and purposes, a computer comprising hardware and software tightly bound with highly specialized peripheral equipment. Thus, many of the functions typically associated with switching do not result from the particular deployment configuration of physical facilities, but are instead due to the ongoing behavior of software as it executes in the switch's processors. In this sense, such functions cannot really be "unbundled" at all. Rather, new logical functions are added that "expose" the target functions by enabling their invocation and manipulation by multiple parties, and by providing an environment where this new activity can be administered and mediated.

5. Being implemented in software, these new unbundling-enabling capabilities consume switch processing resources just as do the object capabilities to which they provide access. Indeed, in the case of simple services such as the delivery of calling party number, the memory space required to administer selection codes for the carriers competing to provide the service may be much larger than the message fields actually used to deliver the calling party number to the CPE.

6. When unbundling schemes are so invasive to the switch that they must be implemented by the switch vendor, the vendor must address the same performance and processor capacity issues it faces when implementing any other switch-based service, feature, or capability. In addition, the switch vendor — as well as every participating carrier — must deal with the same increased developmental, operational, and administrative complexity that comes with the addition of functions to any embedded software system.

7. A given CO switching system, therefore, cannot support an arbitrary number of different unbundled functions, or an arbitrary number of unbundling approaches for the same function. Once a general unbundling scheme is in place, implementing additional, alternative schemes becomes less feasible.

New Markets And Services Are Best Determined By Competitive Forces

8. Any general unbundling scheme, therefore, is actually an active design decision that will impact the network for years to come. Moreover, the consequences which flow from this decision go well beyond mere engineering changes in a switching system. By definition, unbundled functions will be sold from one firm to another, creating a new, albeit intermediary market. Since services are heavily dependent on underlying functions, and functions are dependent on unbundling schemes, if a regulator prescribes one unbundling scheme, those services which may be enabled by other, alternative unbundling schemes may not be implemented, even though they may be preferred by the market. Regulators, then are put in the awkward position of picking technology winners and losers.

9. I have two other concerns about regulatorily-driven unbundling processes. The first is closely related to the one I have already mentioned. Since compromise is an inevitable part of any regulatory process, regulatory processes work best when they are dealing with partitive quantities such as price levels or output levels. In these situations, a decision can be made that comes down firmly midway between levels championed by opposing parties and yet be meaningful to both. Such is not the case when architecting telecommunications networks.

10. Compromise in unbundling schemes is likely to result in the specification of capabilities which have no meaning in the network and no value in the marketplace. Great

amounts of resources can be wasted on developing and deploying functions which no one orders or uses, while the development of useful functions and valuable services is delayed or foreclosed altogether.

11. Second, in the regulatory context it might often be the case that firms are able to participate in the unbundling of functions even though they do not immediately require specific unbundled functions to offer specific services. Such firms may have an incentive to request unbundling when it is not required, or to otherwise engage in strategic or punitive behavior.

Unbundling Should Be Determined By Competitive Forces

12. The concerns above share a common truth: that regulatory and bureaucratic forces are remote from the natural market forces which serve to maximize social utility in an open economy. Nevertheless, the switching network does to a large extent represent a single logically integrated resource where competing claims to develop the same area of functionality must somehow be mediated. I have already indicated my belief that the switching network can support only a handful of basic unbundling arrangements.

13. Unbundling should be left to the technical staffs of the requesting carriers and responding LECs. To the extent that these projects become entangled in regulatory proceedings — or become so formalized that they resemble adjudication — they are likely to yield compromised designs that are suboptimal, if not altogether nonsensical. Although an unbundling framework may be developed through different procedures, actual unbundling processes should be initiated through specific requests from firms seeking unbundling.

14. It is critical, for example, that the requester indicate some level of genuine willingness to pay for access to the functionality they request. The requester should also provide general functional descriptions of the capabilities they wish to access, and the service they wish to implement using the capabilities. Experience has shown that enabling capabilities such as those required to unbundle switch functionality can only be architected effectively when engineers have specific services in mind. In the absence of such services, engineers are prone to specify the implementation of abstract capabilities that are of little use to those with needs driven by the market.

15. It has been my experience that the success of any efforts to develop open interfaces to complex information technology systems is highly sensitive to the procedures in place at the time. I believe that if unbundling is addressed at a technical level by engineers of the requesting party and LEC, the significant engineering resources required to develop unbundled access in local switch networks — and the even greater resources to implement and provision it — may be deployed with some guarantee of efficacy. These policies ensure that unbundling requests are driven by actual market needs, and that the ensuing unbundling is responsive to actual requirements.

16. By way of comparison, it is worth illustrating how the absence of technical involvement by the parties can cause the labor of scores of lawyers, economists, and engineers to be applied suboptimally. Efforts mentioned by the Commission to define the "switch platform" provide a salient example of the confusion that can result when a technical concept is developed through administrative litigation, rather than negotiation among engineers.

An Illustration: The Switch Platform

17. It appears that the process motivating definition of the switching platform began with separate petitions to the Illinois Commerce Commission (ICC) by LDDS and AT&T for the prescription of a "Total Wholesale Service" to be offered by LECs in that state.[1] As initially understood by the ICC, underlying both requests was a basic scheme for reselling the end-to-end totality of LEC services.[2] It appears from the petitions that such functionality would be purchased on a "bundled" wholesale basis from the LEC.[3] Notably, the sole architectural content of the requests for a "Total Wholesale Service" was for the development of generally described administrative interfaces to allow requesting carriers to assign services to subscribers, list them in directories and databases, track their usage, brand the requesting carrier's service, and order repair and maintenance.[4]

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[1] Brief of the ICC Staff, ICC 95-0458, 3-5 (April 12, 1996).

[2] Id. at 8.

[3] Id.

[4] Id. at 37, 40 (although AT&T also requested automatic routing for certain services and access to Advanced Intelligent Network services . . . at para. 15).

18. Thereafter, the process followed several twists and turns typical of innovation by regulation. First, the ICC ruminated over whether the two requests were indeed similar: AT&T, for example, wished to purchase wholesale "all existing retail services"[5] while LDDS wanted to purchase wholesale "the end-to-end network configuration underlying all existing . . . retail services."[6] A petition to consolidate the proceedings was first denied, then granted.

19. Then the Congress acted on a similar matter in a related context. LDDS modified its proposal, and suddenly, where once end-to-end network configuration was sought, LDDS now sought unbundling. Noting that — whatever the petitioners' proposals — the economic risk associated with provisioning telecommunications services would not be appropriately shared, the Staff of the ICC offered yet another proposal, where loop, transport, and local switching capability would be offered on an unbundled basis. The unbundled local switch capability would be offered in the form of a "local switch platform (LSP)" and "resellers could then purchase unbundled switch capacity . . . ."

20. Although discussion of the economic policy aspects of the platform plan was voluminous, the staff provided no further guidance on exactly what a LSP would look like when actually available in the network, beyond the fact that "switching capacity . . . includes all services provided by the switch on a per line basis, e.g., caller ID, call forwarding, etc."[7] The Staff gave no specific indication as to whether "switching capacity" referred to busy hour call attempts, attempts to invoke features, memory allocation, central processor cycles, numbers of lines activated, blocks of telephone numbers, or any of countless other interpretations which might occur naturally to an engineer charged with actually planning the implementation of such

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[5] Id.

[6] Id., citing LDDS Petition at para. 3.

[7] And elsewhere: A reseller would receive a port, all vertical features (caller ID, call waiting, etc.) and originating and terminating switching. Some discussion is given, however, to a function for accessing the administrative capabilities mentioned earlier. Nevertheless, when later in the proceedings Ameritech Illinois describes a platform offering responsive to even this general description, AT&T dismisses it as vague and ill-defined.

an arrangement.[8] Nor was there any discussion of exactly what control a requesting carrier would have over the switch from which they are purchasing capacity.

21. Nevertheless, the Staff stated that "the unbundled LSP [was] no longer a contested issue. . . ." Tellingly, to the Staff "the only remaining issue [was] what price . . . [the LECs should] . . . include in their respected [*sic*] LSP tariffs." Clearly, although the "platform" appears to be an architectural construct, it is actually a regulatory construct motivated and defined strictly by the needs of economists to model prices.[9]

22. The illustration continues. As other parties learned of the developments in Illinois, they injected variations of the concept, even contradictory variations, into proceedings in their own states. In Pennsylvania, for example, one party volunteered a definition of platform which "represents the *combined* purchase of the individual network elements necessary to provide exchange service." The tale grew in the telling. The Illinois staff is clear that entrants would be reselling existing LEC features and services, and that administrative capabilities would be required to activate these on a per line basis. The Pennsylvania testimony initially appears to adopt this aspect of the platform approach by describing packages the entrant may offer, presumably of pre-existing LEC services and features. Later in the testimony, however, the platform becomes orders of magnitude more sophisticated and is capable of enabling the entrant to "define [its own] unique services." Indeed, this ability of the requesting carrier to develop totally new services independently of the LEC "constrained only by its imagination" — capability explicitly contradictory to those contemplated by the ICC Staff — becomes the *sine qua non* of the platform. This metamorphosis from specific tariff pricing device to vague architectural requirement becomes complete when the Commission proposes the concept in the present NPRM, an outcome distinctly at odds with the Commission's goal of establishing a "new regulatory paradigm . . . which accommodates and accelerates technological change and innovation" within the "pro-competitive, deregulatory context of the 1996 Act." NPRM at 3.

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[8] Many of these approaches would require switch vendors to fundamentally alter the way they design their switches. As new services and capabilities were added to the switch the ensuing complexity and interfirm coordination requirements would prove unworkable.

[9] Reply Brief of ICC Staff at 34-35.

Ross M. Richardson

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of the Local Competition Provisions in the Telecommunications Act of 1996	)	CC Docket No. 96-98
	)	
	)	
	)	

DECLARATION OF DR. CHARLES L. JACKSON

1. I am a communications engineer with substantial experience in telecommunications technology. I am employed by Strategic Policy Research, doing business at 7500 Old Georgetown Road, Bethesda, Maryland. I received my undergraduate degree in applied mathematics from Harvard College and my Ph.D. degree in electrical engineering from MIT. I have worked for more than a quarter of a century in the electronics and communications industry. My previous employment has included serving in the Common Carrier Bureau of the FCC, as engineering assistant to FCC Commissioner Robinson, and on the staff of the House Commerce Committee. In the last few years, I have conducted or contributed to several studies of local telecommunications technology. A copy of a more complete biography is available on the Internet at http://www.spri.com/1clj.htm.

2. I define the terms "loop unbundling" and "sub-loop unbundling." I show that loop unbundling has strong analogies to earlier, successful resale requirements in the long distance industry that enabled firms with limited networks to offer more valuable services and to offer services to a larger number of customers. It appears likely that loop unbundling will benefit competition and the public interest. In contrast, I express my belief that neither the market demand for sub-loop unbundling nor the technical feasibility (properly defined) is proven at this time and that the Commission should

proceed carefully with sub-loop unbundling if it wishes to best serve the public interest. I describe the elements of a loop unbundling policy that I think would serve the public interest at this time. The key elements of that policy recommendation are:

- unbundled loops should be provided today,
- sub-loop elements should be provided, if at all, pursuant to a request and negotiation process (including testing and vendor development), and
- rules must protect safety and the technical integrity of the loop plant.

3. I will use the term "loop unbundling" to refer to the sale of the transmission portion of local telephone service (dial-tone loop) without the associated switching services. Typically, such an unbundled loop would be provided by a dedicated copper wire pair running from a telephone company central office to a customer premises or over loop carrier facilities. Such unbundled loops are similar to the channel terminations used with voice-grade analog private line services. Unbundled loops are already offered in several jurisdictions. I will use the term "sub-loop unbundling" to refer to the sale of only part of the transmission portion of local telephone service. That part could be access to the feeder cable but not the distribution cable, access to the distribution cable but not the feeder cable, access to other points along the loop or access to only one of the two wires in a loop.

4. Unbundling loops from switching appears to meet important market needs. In particular, it allows a firm that provides its own physical loops in a restricted geographic area (e.g., the central business district) to offer loops to customers in a wider geographical market area. Such an expanded capability may allow new entrants in local communications to better match the services they offer to consumer needs and natural marketing communications patterns such as television and newspaper circulation coverage and to grow their networks by using LEC loops to fill out their service area. There appears to be a strong parallel here with resale in the long distance industry. At the beginning of long distance competition, resale of AT&T's long distance service allowed a firm with a limited network of its own to expand its network to customers and terminating locations

that its facilities would otherwise not have reached — at least initially. Because most LECs have the network needed to provide unbundled loops throughout their service areas, I believe that it is clear that loop unbundling will meet important market needs and will facilitate competition.

5. In contrast, I have at least six concerns with sub-loop unbundling. First, I find it hard to identify market needs met by sub-loop unbundling. Sub-loop unbundling would allow a firm that has installed fiber to a neighborhood to buy distribution connections from the LEC. But, non-LEC firms can access the distribution connection only if LEC distribution plant terminates at a convenient location or if it is feasible to place a fiber terminal at the feeder/distribution connection point. For a firm to exploit the elements of the unbundled sub-loop, its feeder and distribution plant needs must parallel those of the LEC. However, the plant of a typical LEC has grown up over the last century and reflects the historical evolution of the community and the technology. It appears to me to be unlikely that any firm building a local communications network today would parallel the technology embodied in existing LEC plant. For example, it would be unlikely that the new entrant would use the same division between fiber and copper as does the incumbent. Moreover, it is not apparent to me that there are <u>any</u> services that an entrant could offer over sub-loop elements that it could not offer over an unbundled loop. I do not see how failure to provide sub-loop elements would impair a carrier's ability to offer services. Consequently, I believe that the demand for and the public interest benefits of sub-loop unbundling are far less than those of loop unbundling.

6. Second, sub-loop unbundling will create special problems not encountered in loop unbundling because of a lack of standards and interfaces. Voice grade loop transmission is a reasonably well-defined quantity with standard interfaces (such as main distribution frames) at the central office and the network interface devices at the subscriber premises. Sub-loop transmission elements are not as well defined — nor do they have standard interfaces. For example, loops may have combinations of feeder and distribution, which in turn can be fiber or copper, with some digital loop carrier mixed in. All these facilities

may be underground, buried, or aerial. Moreover, while much telecommunications plant is relatively new, the age of existing plant spans about 50 years — with a few exceptional elements being even older. The notion that there is a single architecture where, say, fiber feeder meets digital loop carrier with distribution on the other side is false. That is why, in fact, when a loop is unbundled from the switch at the central office it is defined as a transmission path between two points, not any particular type of loop technology.

7. Third, the technical feasibility of sub-loop unbundling is unclear at best because of physical limitations on interconnection with the plant as built. One can see that, in the broadest possible sense, it is technically possible to interconnect to an analog copper loop at any point along its length just as it is possible to split a loop into two separate copper conductors and use these loops to communicate using earth return (that is, an electrical circuit created using a copper wire as one conductor and a connection to the ground as the other conductor). In fact, such split loops were commonly used by the alarm industry 25 or 30 years ago, but that practice was discontinued because it led to harmful interference on other communications circuits. Similarly, interconnection at a sub-loop level could eventually be possible at some locations once interfaces were specified and operations support systems developed. But, physical limitations alone probably preclude such multi-carrier interconnection today. Sub-loop unbundling will require additional enclosures to contain cross-connects and other equipment. Such enclosures are not normally in place today, nor have multi-carrier cross-connects been designed. Space will be a significant concern in almost every location, and I imagine the specter and disruption of digging up streets will cause significant community concern. In short, the physical limitations and the potential disruptions to the public are substantial.

8. Fourth, of course, physical interconnection isn't the entire issue. Network security, network maintenance and support by administrative systems are also vital in any assessment of technical feasibility or public interest need. Loop plant was not designed for interconnection with multiple vendors and protection of service reliability and privacy could be compromised if proper safeguards were not employed. It is not clear how sub-

loop elements could be tested or maintained once the element is severed from testing facilities. Indeed, loop testing today is highly centralized and mechanized. Supporting remote sub-loop pieces no longer attached to the system (as might occur if the hypothetical sub-loop element were distribution plant) would require more than software changes; rather the whole system would require re-examination. Moreover, the extensive equipment assignment, inventory, and record keeping systems LECs have in place today were not designed to account for sub-loop sales to others and overhauling them to account for piece parts would be a complicated and time consuming software development task. Any assessment of the technical feasibility of sub-loop unbundling needs to go beyond just physical interconnection and take into account these issues of testing and administrative systems.

9. Fifth, there are problems of safety and control of other harmful externalities that arise with sub-loop unbundling. For example, while loops normally have overvoltage protection circuitry installed where they enter buildings, such equipment is not normally installed at connections in the outside plant. But, once such outside plant connections cross firm boundaries, it may become appropriate to install additional safety protection.

10. Finally, changes in technology may completely change the sub-loop structure without changing the loop service at all. When a LEC adopts a new loop distribution technology (e.g., fiber carrier, hybrid fiber-coax, wireless loops) the technological options for sub-loop transmission will change, while the fundamental loop service will remain almost unchanged. Requiring a LEC to continue to accommodate the needs of those who have purchased sub-loop elements would be unfair (to the LEC, other competitors, and consumers) unless those who were using the sub-loop elements were to pay all the costs of maintaining the older technology in place.

11. I think that the proper regulatory strategy for loop and sub-loop unbundling, at this time, consists of the following policy elements:

- unbundle loops, and

- allow sub-loop unbundling to be explored in the context of the request and negotiation procedure with regulatory oversight contemplated by the Act.

A policy with these elements would have several positive features:

- loop unbundling would serve the vast majority of market needs,
- the requirement to offer sub-loop elements in response to a request and subsequent to negotiations and determinations of technical feasibility would assure competitors access to sub-loop elements that they truly need but would avoid the time and expense of defining unneeded sub-loop elements, and
- the resources of the Commission and the industry would be available to deal with more pressing and important short-run issues. Market needs rather than speculation and lawyers' pleadings would define the sub-loop elements to be offered.

I, Charles L. Jackson, declare under penalty of perjury that the foregoing statement is true and correct to the best of my knowledge and belief.

Charles L. Jackson

May 16, 1996